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Part I	Q1	Q2	Q3	Q4	Total
() $\times 2 =$					

PART I: choose the correct answer

(30 $\times$ 2=60 pts)

1) If $\mathbf{A} = i + 2j - k$ and $\mathbf{B} = 2i + j + k$, then $\mathbf{A} \cdot \mathbf{B}$ equal to

- a) $2i + 2j - k$ b) $2i + 2j + k$ c) 3 d) 5

2) If $\mathbf{A} = i$ and $\mathbf{B} = 5i + 3j$, then $\mathbf{A} \times \mathbf{B}$ equal to

- a) $3k$ b) $-3k$ c) 5 d) 3

3) The coordinates of a particle in meters is given by $x = 2t + t^2$, where t in seconds. The **instantaneous velocity** of the particle at $t = 2$ s is

- a) 4 m/s^2 b) 8 m/s^2 c) 2 m/s^2 d) 6 m/s^2

4) A car accelerates uniformly from rest to 20 m/s in 5 s. The **constant acceleration** of the car is

- a) 5 m/s^2 b) 4 m/s^2 c) -4 m/s^2 d) -5 m/s^2

5) A ball is thrown from the ground vertically upward with initial speed of 6 m/s. When returning to the ground the **average velocity** of the ball is

- a) 6 m/s b) -6 m/s c) 3 m/s d) zero

6) A ball is projected with a speed of 4 m/s that makes 37° with the horizontal. The **speed** of the ball at the highest point is

- a) zero b) 4 m/s c) 3.2 m/s d) 2.4 m/s

7) A ball is thrown from ground level with velocity v_0 directed 30° above the horizontal. If it takes the ball 1 s to reach the maximum height, the magnitude of the initial velocity v_0 ?

- a) 4.9 m/s b) 9.8 m/s c) 11.3 m/s d) 19.6 m/s

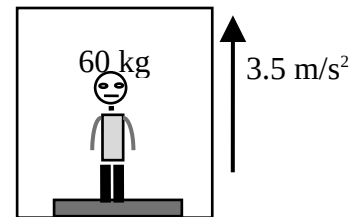
8) A plane is flying at 700 km/h north with respect to air that is blowing at 200 km/h due east. The speed of the plane relative to the ground is

- a) 900 km/hr b) 500 km/hr c) 728 km/hr d) 671 km/hr

9) The property of an object to resist any change of its state is known as

- a) force b) mass c) inertia d) balance

10) A man of mass 60 kg stands on a scale inside an elevator. If the elevator ascending up with an acceleration of 3.5 m/s^2 , the reading of the scale is

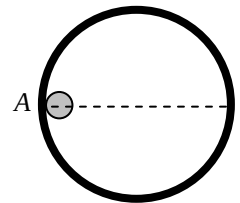


- a) 588 N b) 378 N c) 798 N d) 60 N

11) A car of mass 1200 kg rounds, safely, a flat curve of radius 20 m with a speed of 8 m/s. If the coefficient of friction between the tires and the road are $\mu_s = 0.5$ and $\mu_k = 0.3$. The **frictional force** between the car and the road is

- a) 5880 N b) 3528 N c) 3840 N d) 6000 N

12) A small ball moves through a loop, as shown. At the point directly left to the center of the loop, (point A), the force that causes the ball to travel along a circular path is



- a) the weight b) the normal force c) the friction d) the tension

13) The unit of the gravitational constant G is

- a) kg m/s^2 b) kg m/s c) m/s^2 d) $\text{m}^3/\text{kg.s}^2$

14) The unit of **power** is

- a) $\text{kg m}^2/\text{s}^2$ b) $\text{kg m}^2/\text{s}^3$ c) kg m/s^2 d) $\text{kg m}^2/\text{s}$

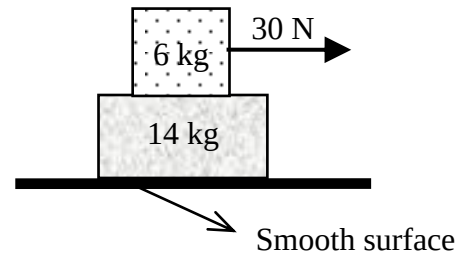
15) If the net work done on an object is zero, then the object's **kinetic energy** K is

- a) increasing b) decreasing c) remains the same d) is also zero

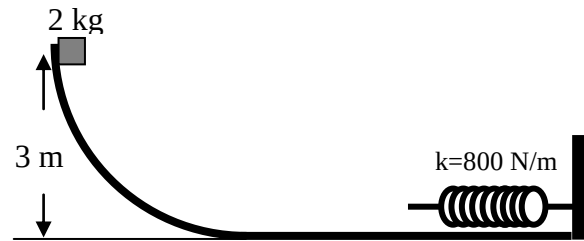
PART II: Solve the following problems**(4×10=40 pts)**

Q1) A 6-kg block is placed on top of a 14-kg block which in turn rests on a smooth horizontal surface, as shown. A horizontal force of 30 N is applied to the 6-kg block. If the coefficients of friction between the two blocks are $\mu_s = 0.6$ and $\mu_k = 0.4$, find

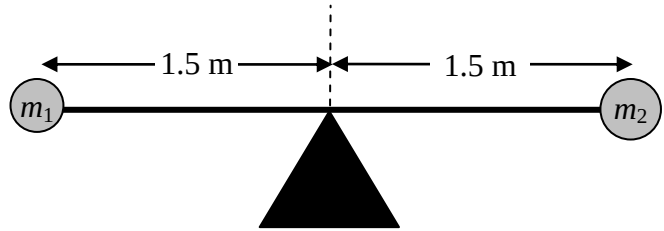
- a) The acceleration of the two blocks
- b) The frictional force between the two blocks



Q2) A 2-kg block is released from rest at the top of the rough track shown the figure. The track is 3-m high. At the end of the track the block hits a spring of force constant 800 N/m compressing it 20 cm before coming to rest momentarily. Calculate the work done by friction.



Q3) Two blocks of masses $m_1=2$ kg and $m_2=6$ kg are connected from the ends of a rigid **massless** rod of length 3 m. The rod is held horizontally on a fulcrum as shown in the figure. If the rod is released from rest, calculate



- The angular acceleration of the system
- the linear accelerations of the blocks as they start to move.

Q4) A uniform ladder of weight 120 N and length 4 m rests against a vertical wall as shown in the figure. The coefficient of static friction between the ladder and both the wall and the floor is 0.4. What is the smallest angle θ between the ladder and the floor for the ladder to remain in equilibrium?

